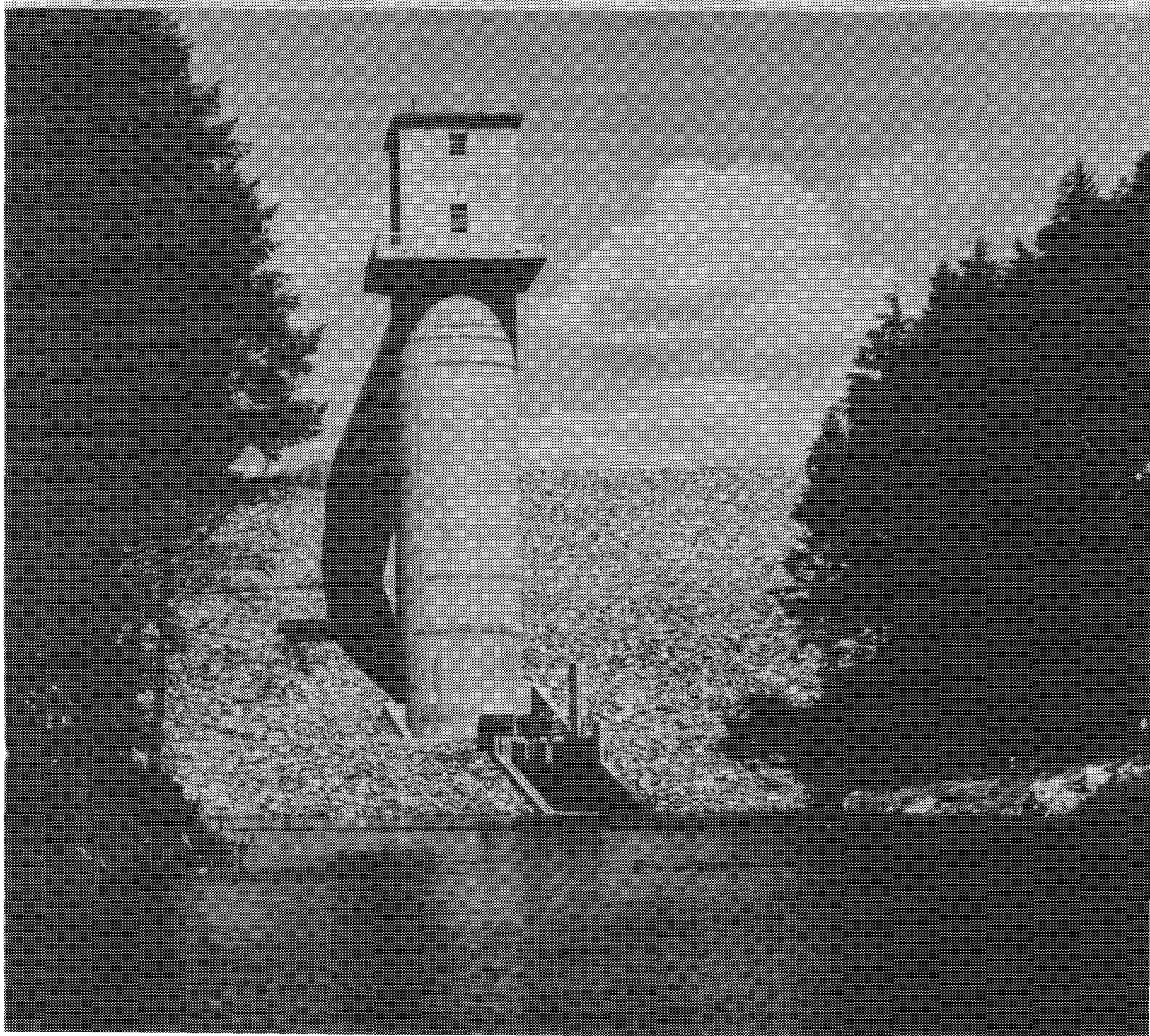
US Army Corps
of Engineers
New England Division
August 1983

Drought Contingency Plan

Black Rock Lake, Thomaston, Connecticut



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Report develops and sets forth a possible drought contingency plan of operation for Black Rock Lake that would be responsive to public needs during drought periods. Scope if plan includes description of existing water supply, conditions, reservoir storage, water quality evaluation, impacts on other projects and conclusions. This site can provide a maximum water supply reserve of about 500 acre-feet (163 million gallons).

DD FORM 1473

HOUSATONIC RIVER BASIN
NAUGATUCK RIVER WATERSHED

DROUGHT CONTINGENCY PLAN
BLACK ROCK LAKE
THOMASTON, CONNECTICUT

AUGUST 1983

NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254

DROUGHT CONTINGENCY PLAN

BLACK ROCK LAKE

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1. PURPOSE AND SCOPE

The purpose of this study and report was to develop and set forth a possible drought contingency plan of operation for Black Rock Lake that would be responsive to public needs during drought periods and identify possible modifications to project regulation within current administration and legislative constraints. The scope of this drought contingency plan includes a description of existing water supply conditions, the possibility of reservoir storage within specified limits, water quality evaluation, discussion of impacts on other project purposes, and summary and conclusions.

2. AUTHORIZATION

Authority for the preparation of drought contingency plans is contained in ER 1110-2-1941 which provides that water control managers will continually review and, when appropriate, adjust water control plans in response to changing public needs. Drought contingency plans will be developed on a regional, basinwide and project basis as an integral part of water control management activities.

3. PROJECT AUTHORIZATION CONDITIONS

Black Rock Lake was authorized by the Flood Control Act approved 14 July 1960, Pulbic Law 86-645, 86th Congress, 2d session substantially in accordance with the recommendations of the Chief of Engineers in House Document 372. This lake has been authorized as a flood control project which includes a permanent conservation pool. Authorization for development and use of the lake area for public recreation and other purposes is contained in section 4 of the Flood Control Act approved 22 December 1944, as amended.

4. PROJECT DESCRIPTION

Black Rock Lake is located in Thomaston and Watertown, Connecticut on Branch Brook, about 2 miles upstream from its confluence with the Naugatuck River (see plate 1).

The lake contains storage for flood control and recreation. The recreation pool at elevation 437 feet NGVD (27-foot stage) contains 305 acre-feet, equal to 0.3 inch of runoff. The flood control storage contains 8,450 acre-feet (2.8 billion gallons) equivalent to 7.8 inches of runoff from the 20.4-square mile drainage area. An area capacity table is shown on plate 2.

Components of the project consist of a rolled earth fill and rock-faced dam, outlet works and a chute spillway. The outlet works are located on the right bank and consist of an intake channel, a concrete weir to maintain a permanent pool, a control tower on the upstream side of the dam, a 704-foot long x 4-foot wide x 5-foot high rectangular conduit, and an outlet channel. The lower part of the control tower contains the gate chamber with two 3 x 4-foot high slide gates at invert elevation 410 feet NGVD. The intake channel weir is located just upstream of gate 1. The 5 stoplog openings of the control weir are 4 feet deep for flexibility in maintaining the level of the permanent pool.

Three water supply reservoirs, owned and operated by the city of Waterbury, Connecticut, located on Branch Brook upstream of Black Rock Lake, are Pitch, Morris and Wigwam.

5. PRESENT OPERATING REGULATIONS

a. Normal Periods. During the nonfreezing season, a small permanent pool approximately 27 feet deep upstream of gate 1, is maintainted by a concrete weir and stoplog structure. This gate is set at a 3-foot opening while gate 2 is set at 0.1 foot. This setting also restricts discharges during unexpected flood conditions, and prevents the loss of fish population while maintaining flow from the top and bottom of the pool. Drawing from the top and bottom constantly mixes the outflow, improving the quality of both the pool and discharge. The pool stage can be maintained between 23 and 27 feet with the use of stoplogs. During the winter, the conservation pool will be maintained at an approximate stage of 27 feet.

b. Flood Periods. The Black Rock project is operated in concert with other projects in the basin to reduce flooding in the downstream Naugatuck River. Operation for floods may be

considered in three phases: Phase I - appraisal of storm and river conditions during development of a flood, Phase II - flow regulation and storage of flood runoff at the reservoir, and Phase III - emptying the reservoir during recession of the flood.

c. Operating Constraints

(1) Minimum Releases. A minimum release of 10 to 20 cfs (6.5 to 13 mgd) is maintained during periods of flood regulation in order to sustain downstream fish life.

(2) Maximum Releases. The maximum nondamaging discharge capacity immediately downstream of Black Rock Lake is about 800 cfs. Releases at or near this rate can be expected whenever peak inflows have exceeded this value and meteorological and hydrologic conditions permit such releases.

6. DESCRIPTION OF EXISTING WATER SUPPLY CONDITIONS

a. General. The following section presents information concerning the existing water supply systems in western and northwestern Connecticut which include Litchfield County in its entirety and portions of Hartford, Middlesex, and New Haven Counties. Tables 1 and 2 contain information about public water suppliers in the area which serve a population greater than 1,000 and projected populations through the year 2030. The tables have been formulated using data primarily provided by the State of Connecticut Department of Enviromental Protection, supplemented with information from the Housatonic River Basin Urban Study, published by the Corps of Engineers in September 1982. Data provided by the State for the major water suppliers include a computer printout of water utility records for 1980, a summary of surface water sources in the study area, and information on ground water sources where available. In those instances where data provided by the State was incomplete, information from the Corps Housatonic River Study was used. Remainder of the missing information was not developed as such efforts were considered beyond the level of detail required for this study.

b. Water Supply Systems. The primary objective of this analysis was to accumulate available data regarding water supply

systems in the vicinity of Black Rock Lake that could benefit from storage in the lake and present it in a manner protraying existing water supply conditions. Projections of future demands were not developed as this study only addresses the effects of drought conditions which may occur at any time in the future. Modifications in the operational procedures at Black Rock Lake would provide storage for water supply purposes only when drought conditions exist and not to meet normal water supply demands at some future date.

c. Western Connecticut Water Suppliers. Information pertaining to the larger water suppliers in western Connecticut are presented in table 1. Data for each supplier includes: the communities served, estimated population served within each community, source of supply (ground or surface), water production in million gallons during 1980, and the estimated safe yield of each source. An analysis as to whether existing sources can provide adquate supplies during drought conditions was not performed. The information has been accumulated to present a summary of the existing water conditions pertaining to major water suppliers in western and northwestern Connecticut.

d. Population Projections. Population projections in table 2 for communities in western and northwestern Connecticut, show the population in each community potentially affected by a prolonged dry period. This data was taken from Population Projections for Connecticut Municipalities and Regions to the year 2000, published by the State of Connecticut Office of Policy and Management. This information is presented to indicate potential future growth in western Connecticut.

7. POTENTIAL FOR WATER SUPPLY REALLOCATION

a. General. According to provisions contained in the Water Supply Act of 1958 (Public Law 500, 85th Congress, Title III), as amended, municipal and industrial water supply storage space may be recommended for inclusion in Corps of Engineers reservoirs. The law provides that up to 15 percent of total storage capacity allocated to all authorized Federal purposes or 50,000 acre-feet (16 billion gallons) whichever is less, may be allocated from the

TABLE 1
MAJOR WATER SUPPLIERS - WESTERN AND NORTHWESTERN CONNECTICUT

Company	Towns Served	Est. Population Served	Source of Supply 1980 Surface	Source of Supply 1980 Ground	Water Production 1980 - MG Surface	Water Production 1980 - MG Ground	Est. Safe Yield MGD Surface	Est. Safe Yield MGD Ground (Active)	Est. Safe Yield MGD (Inactive)	Water Purchased MG
Avon Water Co.	Avon	5720								
	Simsbury	220		x		208.8		.988		
Berlin Water Control Comm.	Berlin	2248		x		208.5		.837		95.0
Bristol Water Co.	Bristol	51450								
	Burlington	45	x	x	2216.2	635.2	3.900	2.050		
Collinsville Division CT. Water Co.	Avon	473								
	Burlington	137								
	Canton	2418		x		.8		-		96.0
Cromwell Fire Dist. Water Div.	Cromwell	9000		x		315.5		1.296	.619	
Farmington Water Co. Main Sys.	Farmington	3000								147.0
Farmington Woods Water Co.	Avon	875								
	Farmington	375		x		63.3		.027		
Heritage Village Water Co.	Middlebury	25								
	Oxford	50								
	Southbury	5500		x		352.7		.902	.621	
Indian Hill WC, Ind. Field Co.	Naugatuck	1398		x		-		.346		
Kensington Fire Dist.	Berlin	9000		x		-		-		-
Lakeville Div., Litch Co. WC	Salisbury	3199		x		124.1[1]		.756	.864	
Litchfield Div., Litch Co. WC	Litchfield	2576		x		94.9		.345	.017	
Meriden Water Dept.	Meriden	57118	x	x	1818.1	738.9	5.200	2.370	3.350	
Met. Dist. Water Bureau	Bloomfield	18595								
	E. Hartford	52554								
	Farmington	650								
	Glastonbury	14200								
	Hartford	136319								
	Manchester	1000								
	Newington	28839								
	Rocky Hill	14559								
	S. Windsor	3300								
	W. Hartford	61301								
	Wethersfield	26013								
	Windsor	25171	x		20972.0		43.000			
Middletown Water Dept.	Middletown	35000	x	x	830.9	837.4	2.230	4.260	1.340	

TABLE 1 (Continued)
MAJOR WATER SUPPLIERS - WESTERN AND NORTHWESTERN CONNECTICUT

Company	Towns Served	Est. Population Served	Source of Supply 1980 Surface	Source of Supply 1980 Ground	Water Production 1980 - MG Surface	Water Production 1980 - MG Ground	Est. Safe Yield MGD Surface	Est. Safe Yield MGD Ground (Active)	Est. Safe Yield MGD (Inactive)	Water Purchased MG
Naugatuck Div. CT. Water Co.	Beacon Falls	200								
	Naugatuck	18851								
	Waterbury	315	x	x	1163.8	49.5	4.770[1]	-		
New Britain Water Dept.	Berlin	180								
	Farmington	495								
	New Britain	73840								
	Newington	800								
	Plainville	50	x		4040.0		8.000			
New Hartford Water Dept.	New Hartford	1068								64.2
New Milford Water Co.	New Milford	5300	x	x	132.4	206.6	.964[1]	.810		
North Canaan Div. Litch Co. WC	N. Canaan	1687		x		118.6[1]		.540		
Plainville Water Co.	Bristol	45								
	Plainville	16351								
	Southington	458		x		905.7		2.948		75.2
Southbury Training School	Southbury	2450		x		118.6[1]		.658		
Southington Water Works Dept.	Cheshire	248								
	Southington	34568	x	x	278.7	995.6	-	1.836	1.593	
Terryville Div. CT Water Co.	Plymouth	5642	x	x	5.9	155.6	-	.740		
Thomaston Div. CT Water Co.	Thomaston	2831	x	x	110.1	71.8	.400	.110		47.6
Torrington Water Co. Main Sys.	Torrington	-	x		1589.7		4.720[1]			
Unionville Water Co.	Avon	956								
	Farmington	5320		x		185.9	-	-	.648	47.3
Waterbury Water Bureau	Waterbury	103300	x		7823.0		70.500			
Watertown Fire Dist.	Watertown	6600	x	x	0	301.5	1.390	12.800		1.5
Western Sec., No. Div. CT WC	E. Windsor	2849								
	Enfield	21686								
	S. Windsor	6591								
	Suffield	5317								
	Vernon	171								
	Windsor Locks	12365		x		1361.7		.385		374.8
Woodbury Water Co.	Woodbury	1700		x		59.6		.108	.162	

[1] Information taken from Housatonic River Basin Urban study, U.S. Army Corps of Engineers, September 1982. All other information provided by the State of Connecticut, Department of Environmental Protection, Natural Resources Center.

TABLE 2
POPULATION PROJECTIONS

Hartford County	Census 1980	1985	1990	1995	2000	% Change
Avon	11,201	12,200	13,200	13,700	14,200	26.8
Berlin	15,121	15,520	15,920	15,970	15,840	4.8
Bloomfield	18,608	19,510	20,310	21,110	22,110	18.8
Bristol	57,370	58,870	59,970	60,770	61,470	7.1
Burlington	5,660	5,970	6,230	6,430	6,540	15.5
Canton	7,635	7,970	8,320	8,530	8,650	13.3
East Granby	4,102	4,300	4,540	4,730	4,870	18.7
Farmington	16,407	16,710	17,010	17,110	17,610	7.3
Granby	7,956	8,360	8,860	9,260	9,760	22.7
Hartford	136,392	136,390	138,390	140,890	143,390	5.1
Hartland	1,416	1,460	1,530	1,610	1,670	17.9
New Britain	73,840	73,940	73,380	72,270	70,810	-4.0
Newington	28,841	29,640	30,640	31,640	32,140	11.4
Plainville	16,401	16,900	17,370	17,570	17,500	6.7
Rocky Hill	14,559	16,560	18,560	20,060	21,560	48.1
Simsbury	21,161	22,160	23,360	24,660	26,160	23.6
Southington	36,879	37,880	39,380	40,580	41,580	12.7
Suffield	9,294	9,550	9,740	9,890	9,860	6.1
West Hartford	61,301	61,210	61,290	60,910	60,070	-1.9
Wethersfield	26,013	26,310	26,510	26,810	27,010	3.8
Windsor	25,204	26,400	27,500	28,700	29,700	17.8
Windsor Locks	12,190	12,420	12,620	12,620	12,320	1.1
TOTALS	607,551	620,230	634,630	645,820	654,820	7.8

TABLE 2 (Continued)
POPULATION PROJECTIONS

Litchfield County	Census 1980	1985	1990	1995	2000	% Change
Barkhamsted	2,935	3,050	3,230	3,390	3,490	18.9
Bethlehem	2,573	2,710	2,850	2,980	3,120	21.3
Bridgewater	1,563	1,610	1,690	1,730	1,810	15.8
Canaan	1,002	1,020	1,030	1,040	1,050	4.8
Colebrook	1,221	1,250	1,280	1,310	1,350	10.6
Cornwall	1,288	1,300	1,310	1,320	1,330	3.3
Goshen	1,706	1,860	1,960	2,090	2,210	29.5
Harwinton	4,889	5,170	5,470	5,730	5,920	21.1
Kent	2,505	2,630	2,760	2,880	2,960	18.2
Litchfield	7,605	7,830	8,010	7,990	8,040	5.7
Morris	1,899	1,930	1,960	2,000	2,000	5.3
New Hartford	4,884	5,070	5,240	5,320	5,350	9.5
New Milford	19,420	20,420	21,120	22,020	23,120	19.1
Norfolk	2,156	2,160	2,170	2,200	2,230	3.4
North Canaan	3,185	3,210	3,220	3,230	3,240	1.7
Plymouth	10,732	11,080	11,380	11,600	11,730	9.3
Roxbury	1,468	1,590	1,720	1,840	1,970	34.2
Salisbury	3,896	3,930	3,980	4,010	4,040	3.7
Sharon	2,623	2,640	2,670	2,690	2,720	3.7
Thomaston	6,276	6,390	6,570	6,730	6,780	8.0
Torrington	30,987	31,290	31,490	31,790	31,990	3.2
Warren	1,027	1,050	1,090	1,110	1,120	9.1
Washington	3,657	3,710	3,760	3,810	3,860	5.6
Watertown	19,489	19,790	20,090	20,390	20,690	6.2
Winchester	10,841	10,790	10,960	11,090	11,170	3.0
Woodbury	6,942	7,110	7,220	7,280	7,260	4.6
TOTALS	156,769	160,590	164,230	167,570	170,550	8.8

TABLE 2 (Continued)
POPULATION PROJECTIONS

Middlesex County	Census 1980	1985	1990	1995	2000	% Change
Cromwell	10,265	10,870	11,570	12,170	12,770	24.4
Middlefield	3,796	4,000	4,200	4,340	4,320	13.8
Middletown	39,040	40,440	41,740	43,140	44,540	14.1
TOTALS	53,101	55,310	57,510	59,650	61,630	16.1
New Haven County						
Beacon Falls	3,995	4,150	4,250	4,350	4,400	10.1
Cheshire	21,788	23,290	24,790	25,790	26,790	23.0
Meriden	57,118	57,670	58,020	58,120	58,870	3.1
Middlebury	5,995	6,080	6,200	6,310	6,380	6.4
Naugatuck	26,456	27,150	28,040	28,900	29,640	12.0
Oxford	6,634	7,210	7,680	8,140	8,540	28.7
Prospect	6,807	6,790	6,810	6,760	6,630	-2.5
Southbury	14,156	15,060	15,760	16,460	17,260	21.9
Waterbury	103,266	102,760	103,660	104,530	105,410	2.1
Walcott	13,008	13,220	13,650	13,940	13,990	7.5
TOTALS	259,223	263,380	268,815	273,300	277,910	7.2

storage serving authorized purposes to storage serving municipal or industrial water supply within the Corps discretionary authority.

In addition, guidance contained in ER 1110-2-1941 directs field offices to determine the short term water supply capability of existing Corps reservoirs that would be functional under existing authorities.

b. Drought Contingency Storage. It has been estimated that a small amount of the existing storage at Black Rock Lake can be put to multiple use for drought contingency as well as flood control. This infringement would result in a maximum pool elevation of about 444 feet NGVD (34-foot stage), representing a total volume of about 500 acre-feet, or about 197 acre-feet over the permanent pool storage level. The total volume of 500 acre-feet (163 million gallons) constitutes about 6 percent of the total reservoir storage. It was concluded that this was the maximum infringement for drought purposes without seriously inundating two reservoir roads. Additionally, further infringement may kill timber and vegetation in the uncleared reservoir areas impacting water quality and aesthetics.

The top of the stoplog structure is at elevation 437 feet NGVD; therefore, higher pool levels would be maintained by regulation of the flood control gates. Since inflow to the reservoir can fluctuate within short periods of time, monitoring of the pool level would be required on at least a daily basis.

Based on an all-season low flow duration analysis for Branch Brook at Black Rock Lake using estimating methods developed by the US Geological Survey, it was determined that during a 10-year frequency drought there would be sufficient riverflow either to maintain a water supply yield of about 1 cfs (0.7 mgd) or to fill the reservoir from elevations 437 to 444 feet (197 acre-feet) in an 86-day period, provided no releases were made downstream. Based on the low flow analysis, it was determined that a flow of about 2 cfs from the upstream watershed would not be available for approximately 120 days. Once a flow of 2 cfs (0.1 cfs/square mile) was reached and maintained then either a water supply yield of 0.6 cfs (0.4 mgd) could be maintained or the project could be filled to the 444 foot NGVD level over a 152-day period. It was

further concluded that in the event of a severe drought emergency, all water in storage could be made available for water supply providing 500 acre-feet (163 million gallons) if the storage were initially at elevation 444 feet NGVD. Water stored could be drawn directly from the reservoir pool or released downstream. Drought contingency storage versus flow duration at Black Rock Lake is shown graphically on plate 3.

8. WATER QUALITY EVALUATION

a. Water Quality Classification. Branch Brook within the Black Rock Lake boundaries and downstream to the confluence with the Naugatuck River is designated class B by the Connecticut Department of Environmental Protection. Class B waters are suitable for bathing, recreational uses, agricultural uses, and industrial processes including cooling and providing excellent fish and wildlife habitat. Public water supply after treatment is not one of the uses given in Connecticut Water Quality Standards for class B waters. However, a water which meets class B standards could be made potable with standard treatment processes. In addition, this portion of Branch Brook has also been classified as a cold water fishery including fish spawning and growth. Technical criteria for these waters include dissolved oxygen levels greater than 4 mg/l, turbidity levels less than 10 JTU, fecal coliform levels less than 200/100 ml, pH in the range from 6.5 to 8.0, and no chemical constituents in concentrations or combinations which would be harmful to human, animal or aquatic life.

b. Existing Water Quality. There are few residences and no point source discharges in the Black Rock Lake watershed. Black Rock Lake has high quality water which generally meets or exceeds Connecticut class B standards. The principal water quality concern is the frequent occurrence of low pH levels caused, most likely, by acid precipitation on poorly buffered New England soils and the natural effects of upstream swamps and marshes. High coliform levels have been measured in the past, but no recent data are available to determine if a problem exists. Given the undeveloped nature of the watershed, it is unlikely that high coliform levels would be a problem. Other lesser concerns include high color levels and rare low DO levels. Turbidity, nutrients, and metals levels are low and are not problems.

c. Stratification Patterns. Lake profile data have not been collected at Black Rock Lake; however, its stratification patterns can be inferred from other similar NED projects at which water quality profiles have been measured. Black Rock Lake probably experiences only slight to moderate temperature induced density stratification during the summer. Low DO conditions would be expected in the hypolimnion but anaerobic conditions would be rare and of short duration. Some increases in iron, manganese, and nutrients would occur during periods of anaerobiasis.

d. Water Quality Requirements for Drought Storage. The two requirements on waters to be met are the State standards for surface waters and quality suitable for domestic or industrial water supply use. Class B waters are not designated for use as public water supply. However, a water which meets class B standards would not likely require excessive treatment costs to improve it to a level such that it could be used for public water supply. The water quality required for industrial water supply depends on the specific industrial process involved.

e. Effects of Drought Storage. The impact of increasing the pool at Black Rock Lake on water quality will be minor. The principal changes that could occur would be an increase in the temperature of the lake and discharge from the lake. Other possible changes include increases in metals and nutrients levels in the lake.

Increasing the size of the permanent pool at Black Rock Lake will increase the hydraulic detention time in the lake. This will cause a warming of the lake waters and increases in the frequency, duration, and strength of the anaerobic layer in the hypolimnion. Because nutrients and metals, particularly iron and manganese, can be released from sediments under anaerobic conditions, an increase in anaerobiasis would be expected to increase levels of these parameters. A positive effect of increasing the hydraulic detention time would be a reduction in turbidity and coliform levels through settling and natural die-off. All these changes are expected to be small.

f. Conclusions. Raising the pool at Black Rock Lake to elevation 444 feet NGVD as proposed most likely will cause no more than minor water quality problems. The stored water will be of a basically

good quality that will meet class B standards and be usable for public water supply after treatment and for all other uses.

9. DISCUSSIONS OF IMPACTS

a. General. Any action resulting in a temporary change of reservoir storage volume will have impacts on other project purposes which must be evaluated before a storage reallocation plan can be implemented. At Black Rock Lake, an evaluation has been made of the impacts resulting from drought contingency storage on the flood control purpose of this project. Effects on recreation, sedimentation and the aquatic and terrestrial environments as well as the historic and archeological resources have also been addressed.

b. Flood Control. A review of the regulation procedures at Black Rock Lake was undertaken to determine the volume of water that could be made available for drought contingency purposes. The water would be stored by temporarily utilizing existing flood control storage. It is recognized that major floods occur in every season of the year, and any use of flood control storage would be continually monitored to insure there would be no adverse impacts on downstream flood protection.

The maximum pool elevation at Black Rock Lake for drought contingency storage has been estimated to be elevation 444 feet, representing an infringement on the flood control storage of about 0.2 inch of runoff from the upstream 20.4-square mile drainage area.

c. Recreation. The State of Connecticut is presently installing a beach on State-owned land at elevation 437 feet NGVD, to act as a substitute for another nearby State facility which is closed for repair. This facility will be used for the next several years. Both the beach and the access road would be inundated at elevation 444.

d. Sedimentation. Some slumping, erosion and turbidity can be expected with the proposed increased pool levels.

e. Project Operation. Maintaining the pool level at elevation 444 feet (34-foot stage) by means of gate regulation will have a significant impact on project personnel in the requirement of daily or more frequent gate adjustments. Users of the proposed

drought storage may be required to bear the expense of the increased labor costs.

The proposed increase in the impoundment may result in a tree kill along the entire shoreline, resulting in a significant impact on cleanup efforts. The added cost of the cleanup may also be an additional cost to the users.

10. POTENTIAL ENVIRONMENTAL IMPACTS

a. Drought Contingency Operation. The proposed plan would involve temporarily increasing the existing 27-foot deep reservoir to a 34-foot pool for potential water supply use during drought conditions. The 10-year frequency low flow would be imposed on the downstream use beginning in May and would last throughout the drought period. Typical hydrological conditions indicate that inflows would not be stored until September when they exceed 2 cfs. At that time, the anticipated rate of pool increase would be about two inches per day over a 47-day period.

b. Effects on the Aquatic Environment. The aquatic environment of the project area consists of Branch Brook, upstream and downstream of the dam and its tributaries and Black Rock Lake. Branch Brook is considered by the State Department of Environmental Protection as a "good" trout brook with good streamside vegetative cover and class "B" waters. The reservoir is stocked with brown, rainbow and brook trout by the State which meets some of the angling demands of the area. The State of Connecticut indicated that the fishery is basically "put and take" with no confirmed records of natural reproduction. The reservoir also provides warm water fish habitat for bullheads, largemouthed bass, sunfish, perch and other species.

An increase in the impoundment due to the proposed contingency storage would temporarily inundate the stream habitat of Branch Brook during the fall and throughout the storage period. This would probably not have more of a significant adverse effect than has occurred with past flood control operations. The increase in storage should not impact the reproduction of most warm water species in the reservoir which generally occurs during spring and early summer. The warm water fishery may in fact benefit from the small amount of nutrients expected to be introduced into the lake.

The downstream impacts also may not be significant. The imposition of the 10-year frequency low flow in a drought year would not appreciably change the flow throughout spring and summer. Significance of the impacts in the fall would depend on whether the downstream area is utilized for spawning by trout.

c. Effects on the Terrestrial Environment. The terrestrial environment at the project consists primarily of forest shrub and open vegetative cover types. The forests are primarily made up of hardwoods such as oak, hickory, beech, birch, maple and aspen and softwoods like hemlock and white pine. Open land which consists of the damsite, old fields and a portion of a borrow area comprise approximately 30 percent of the reservoir. Wildlife that use the habitat may be classified as "farmland" species which are adapted to farm and residential environments and require a good mix of wooded and open land. The reservoir has been cleared to the 437 foot elevation, NGVD.

White tail deer frequent the reservoir lands, moving in from adjacent farms and woodlands. No evidence of deer yarding in winter is present. The State stocks ring-necked pheasants for the fall hunting season.

Black Rock Lake lies enroute to the Atlantic flyway for many migratory waterfowl and hawks. Lack of emergent vegetation for food and cover, and the unpredictable water level in the spring and fall discourage all but occasional use by waterfowl. Lack of wetland areas along the water courses virtually eliminates suitable waterfowl nesting and brooding sites. Some furbearers, mainly muskrat, inhabit the reaches of the brook upstream of the lake; occasional evidence of beaver has been observed. Limiting factors are a lack of a wetland (marsh) habitat and streambank characteristics.

The proposed increase in the impoundment would temporarily inundate about 11 acres of forest and open land habitats near the end of the growing season. Storage would probably kill tree species such as sugar maple, birches, beech, white pine, hemlock and oaks between the 437 and 444 foot elevations. Storage during April and May of this year caused considerable loss of hemlock in the lower impoundment area.

The anticipated loss of vegetation would degrade wildlife habitat for most of the impounded area. Wildlife would be displaced on adjacent land where the habitat would probably not be able to support the added individuals.

11. HISTORIC AND ARCHEOLOGICAL RESOURCES

The major potential impact of a drought contingency plan at Black Rock Lake upon historic or archeological sites would be from prolonged inundation of the area below elevation 444. While no structures are recorded as being removed from this area during the time of dam construction, earlier historic and prehistoric sites could exist.

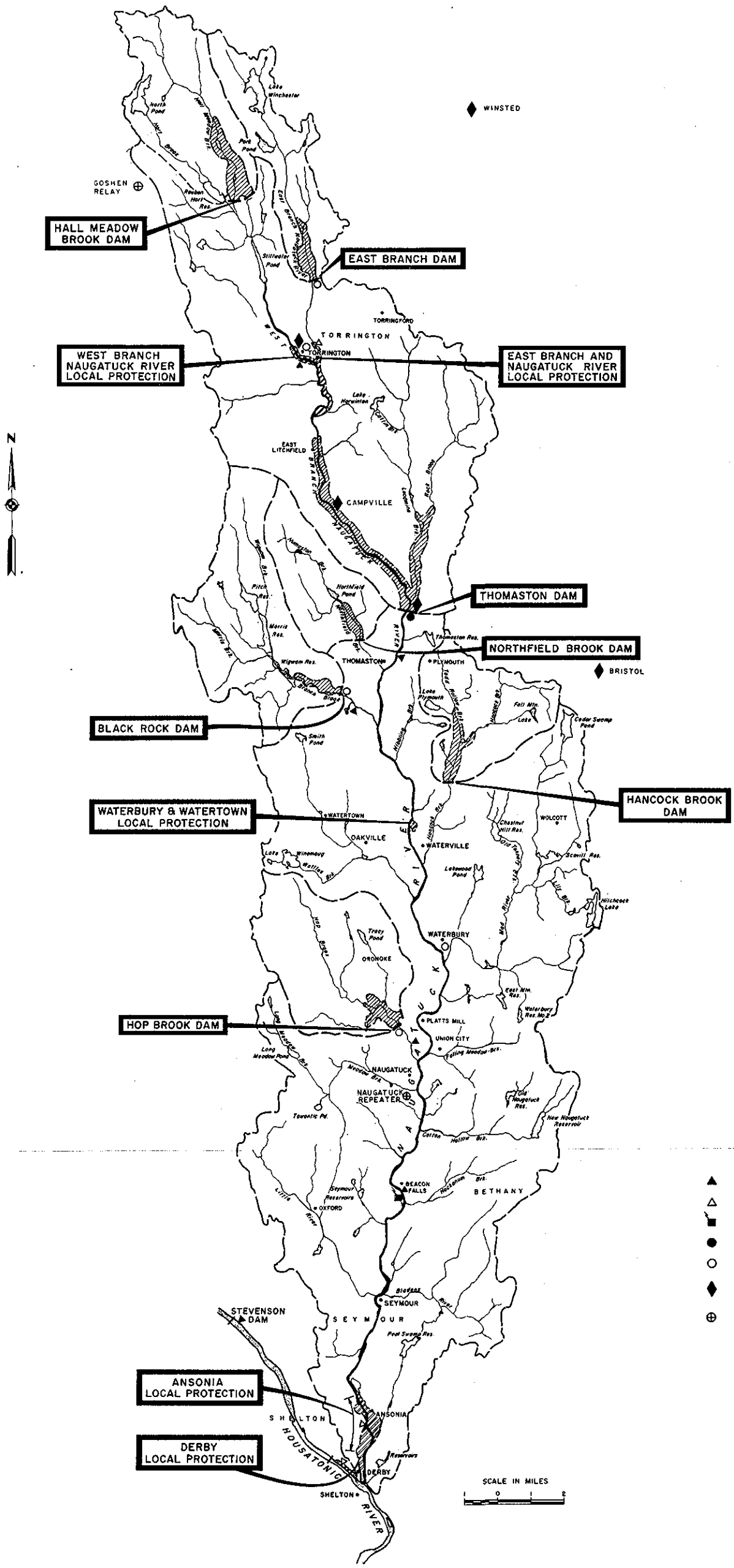
12. SUMMARY AND CONCLUSIONS

A drought contingency plan was studied for Black Rock Lake in an effort to be responsive to public needs during drought situations. A 90 percent chance of dependable water supply yield of about 0.6 cfs (0.4 mgd) could be provided while still maintaining a downstream release of about 2 cfs or the project filled to elevation 444 feet NGVD, providing a maximum water supply reserve of about 500 acre-feet (163 million gallons).

An evaluation of the effects of this drought contingency plan on the various project features, as well as on certain environmental aspects, has revealed some impacts. This evaluation was based on preliminary studies utilizing readily available information.

CORPS OF ENGINEERS

U.S. ARMY



LEGEND

- ▲ RECORDING GAGE (RIVER)
- △ NON-RECORDING GAGE (RIVER)
- ■ TELEMARK GAGE
- ● RECORDING GAGE (RAINFALL)
- ○ NON-RECORDING GAGE (RAINFALL)
- ♦ SNOW SURVEY COURSE
- ⊕ AUTOMATIC HYDROLOGIC RADIO REPORTING NETWORK RELAY (CONTAINS RADIOS TIED DIRECTLY TO R C C COMPUTER ROOM)

WATER RESOURCES DEVELOPMENT PROJECT

HOUSATONIC RIVER BASIN

NAUGATUCK RIVER WATERSHED MAP

NEW ENGLAND DIVISION WALTHAM, MASS

SEPTEMBER 1976

PLATE 1

BLACK ROCK LAKE
AREA-CAPACITY TABLE
DRAINAGE AREA = 20.4 SQUARE MILES

Stage (ft)	Elev. (msl)	Area (acres)	Capacity (ac/ft)	Capacity (inches)	Stage (ft)	Elev. (msl)	Area (acres)	Capacity (ac/ft)	Capacity (inches)
0	410	0	0	0	56	466	74	1,311	1.20
2	412	2	2	0	58	468	78	1,463	1.34
4	414	4	8	0.01	60	470	83	1,624	1.49
6	416	6	18	0.02	62	472	87	1,794	1.65
8	418	7	31	0.03	64	474	92	1,973	1.81
10	420	8	46	0.04	66	476	97	2,162	1.99
12	422	10	64	0.06	68	478	101	2,360	2.17
14	424	12	86	0.08	70	480	106	2,567	2.36
16	426	14	112	0.10	72	482	110	2,783	3.56
18	428	16	142	0.13	74	484	114	2,007	2.76
20	230	17	175	0.16	76	486	118	3,239	2.98
22	432	18	211	0.19	78	488	122	3,479	3.20
24	434	19	250	0.23	80	490	126	3,727	3.43
26	436	20	292	0.27	82	492	130	3,983	3.66
27*	437	21	305	0.29	84	494	134	4,247	3.90
27	437	21	0	0	86	496	138	4,519	4.15
28	438	25	24	0.02	88	498	143	4,800	4.41
30	440	28	77	0.07	90	500	147	5,090	4.68
32	442	30	135	0.13	92	502	151	5,388	4.95
34	444	32	197	0.18	94	504	156	5,695	5.23
36	446	35	264	0.24	96	506	160	6,011	5.52
38	448	37	336	0.31	98	508	163	6,334	5.82
40	450	40	413	0.38	100	510	168	6,665	6.13
42	452	44	497	0.46	102	512	172	7,005	6.44
44	454	47	588	0.54	104	514	176	7,353	6.76
46	456	52	687	0.63	106	516	180	7,709	7.09
48	458	56	795	0.73	108	518	185	8,074	7.42
50	460	60	911	0.84	110	520	190	8,450	7.80
52	462	64	1,035	0.95					
54	464	69	1,168	1.07			(Spillway Crest)		

*Recreation Pool

PLATE 2

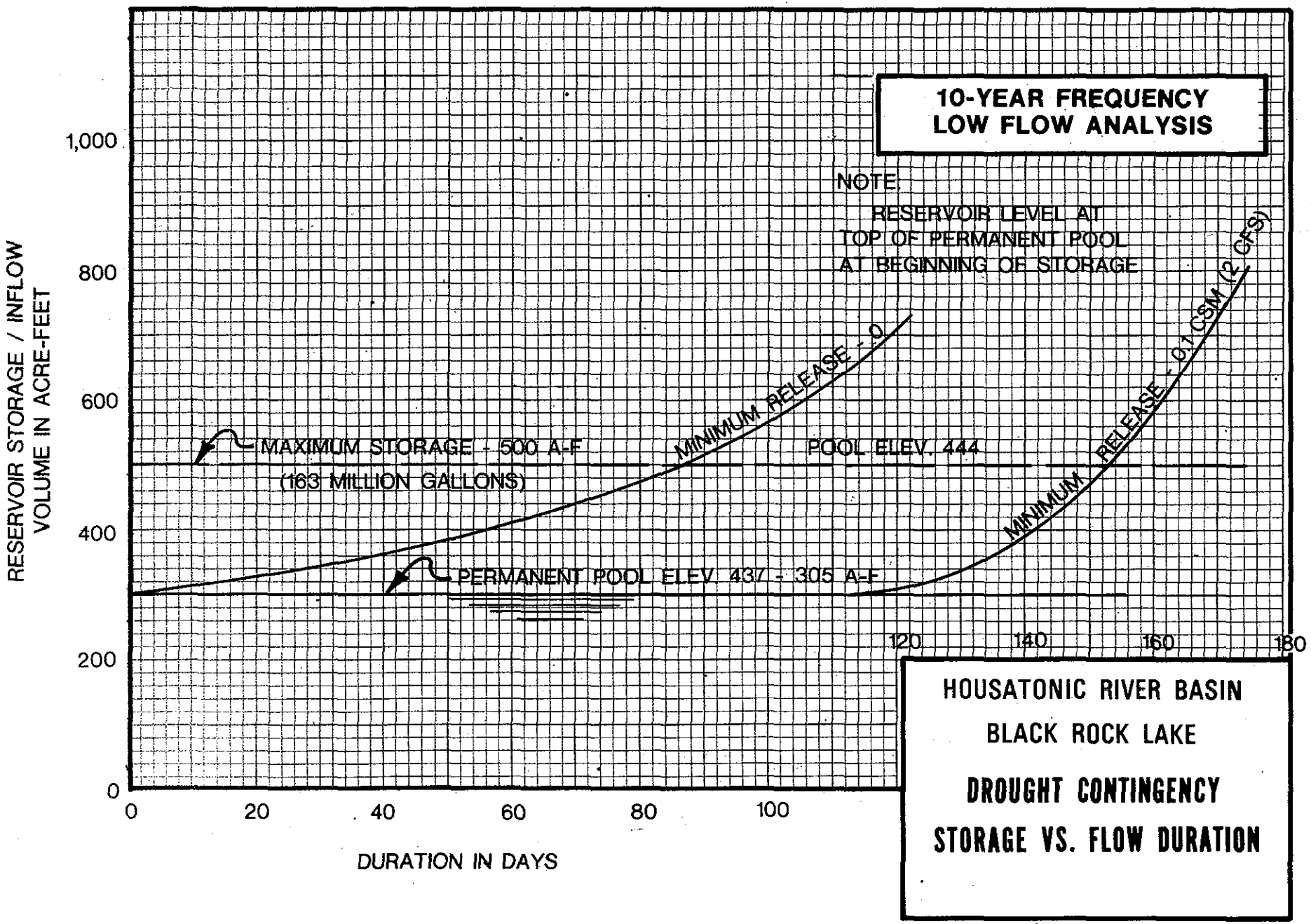

10-YEAR FREQUENCY
LOW FLOW ANALYSIS
NOTE:
RESERVOIR LEVEL AT
TOP OF PERMANENT POOL
AT BEGINNING OF STORAGE
MINIMUM RELEASE - 0
MINIMUM RELEASE - 0.1 CSM (2 CFS)
MAXIMUM STORAGE - 500 A-F
(163 MILLION GALLONS)
POOL ELEV. 444
PERMANENT POOL ELEV. 437 - 305 A-F
RESERVOIR STORAGE / INFLOW
VOLUME IN ACRE-FEET
1,000
800
600
400
200
0
0
20
40
60
80
100
120
140
160
180
DURATION IN DAYS
HOUSATONIC RIVER BASIN
BLACK ROCK LAKE
DROUGHT CONTINGENCY
STORAGE VS. FLOW DURATION

PLATE 3